Polymer Science U.S.S.R. Vol. 31, No. 11, pp. 2455–2461, 1989
Printed in Poland

0032-3950/89 $10.00+.00

ANISOTROPY OF THE MOLECULAR MOTION OF DI-2-ETHYLHEXYL SEBACATE IN ORIENTED SAMPLES OF PLASTICIZED POLYVINYL CHLORIDE*

V. A. TYURIN and A. I. MAKLAKOV

Kazan Lenin State University

(*Received* 9 *February* 1988)

The uniaxial stretching of samples of PVC plasticized by di-2-ethylhexyl sebacate retards the molecular mobility of the plasticizer inducing its anisotropy. This leads to complication of the form of the decay of transverse nuclear magnetizability, increase in the rate of relaxation of the slowly decaying component $T_{2a}^{-1}(\lambda, \theta')$ and the appearance of a dependence on the angle θ' between the axis of stretching and the vector of the constant magnetic field H_0. The second moment of part of the dipole-dipole interaction averaged by the rotation of the molecule about the axis perpendicular to the main one with increase in λ changes the character of the dependence on θ' to the opposite.

THE pulse NMR method is widely used to study molecular mobility in oriented complex polymeric composites [1–4]. Thus, in [4] information was obtained on the behaviour of the molecules of the solvents C_6F_6 and p-$C_{16}H_{34}$ in the oriented matrix of natural *cis*-polyisoprene. In particular, the appearance of the sharply anisotropic character of the motion of the molecules of the low molar mass substance is noted for minor strains of the polymer matrix. However, the behaviour of the plasticizer molecules of practical importance in the matrix of polymers has been insufficiently studied [5, 6]. Therefore, the present work is aimed at investigating the molecular mobility of the plasticizer in the oriented PVC matrix.

We investigated PVC of the C-70 grade plasticized by di-2-ethylhexyl sebacate (DOS) of chemically pure grade the weight concentration of which in the system was 59%. The starting samples were prepared on laboratory rollers at 160°C in the form of plates. The other conditions of preparation and the thermostabilizing additives are the same as in reference [6]. The samples for NMR measurements were prepared by a technique similar to that described in reference [4]. Samples were investigated for multiplicities of stretching $\lambda = 1$, 1·5, 2, 2·5 and 3 which will hereafter be referred to as samples 1, 2, 3, 4 and 5. The attenuation of transverse nuclear magnetizability (a.t.n.m.) was recorded for values of θ' in the interval 0–90°. The measurements were at room temperature by the Hahn method with the NMR laboratory relaxometer [7].

Attenuation of transverse nuclear magnetizability of plasticized PVC may be approximated by the sum of three components [6]. The protons of the plasticizer molecules contribute to the most slowly relaxing component. The protons of the polymer

* Vysokomol. soyed. A31: No. 11, 2243–2248, 1989.